

Diagnostics for heavy ion beam driven Warm dense matter experiments

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A set of diagnostic has been developed for the WDM experiments at Berkeley. The diagnostics are aimed at the in-situ measurement of temperature, expansion velocity and pressure of a WDM sample. A specially developed two-channel pyrometer probes color temperatures at 750 nm, 1000 nm and 1400 nm, with 75 ps temporal resolution. The system has a broad dynamic range with a lower limit ~ 2000 K and upper limit ~ 100000 K. The pyrometer design is based on custom spectrally selective beam splitters and can be upgraded up to seven channels. Continuous target emission from 450 nm to 850 nm is recorder by a custom spectrometer, consisting of a high dynamic range Hamamatsu streak camera and a holographic grating. The system is calibrated absolutely with a tungsten ribbon lamp (NIST traceable). The various sweeping times of the streak unit allows for temporal resolution varying from 1 ps to 1 us. The spectrometer has a lower sensitivity than the pyrometer and applied in experiments with higher temperatures. Hydrodynamic expansion velocity of a target's free surface is measured by a commercially available all-fiber Doppler shift laser interferometer (VISAR). The installed delay etalon allows for velocity detection with 2 m/s precision and 0.5 ns resolution.

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